Transfusion Medicine

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P RBC's

WRAMC PARAMETERS

- **Hospital Threshold→** Hgb <8, Hct <25
- **With Pathologist approval →** Hgb ≥8.1, Hct ≥25.1

- **What is ideal RBC transfusion threshold?**
  - **Data to suggest hgb > 12 in patient with COPD Work of breathing and minute ventilation**
  - **Small study found cardiac events higher post arterial bypass sx in patients with Hct <28%**
  - **Tissue O2 delivery is likely adequate to Hgb of @ 7 g/dL**
  - **Heart begins to produce lactate with Hct in 15-20% range**
  - **Heart failure not until Hct < 10%**
- **One Unit PRBC's: Hct by ≈ 3% or Hgb by 1g/dL**
- **One unit pRBC's = 220 – 260 cc volume**
- **Shelf life approx 35 days, 42 days max**
- **Irradiated /Leuko – reduced:**
  - **One unit pRBC's contains ≈ 1 x 10^9 WBC's**
  - **Leukopore filter at bedside. CMV, alloimmunization, N TA-GVHD**
  - **Irradiation: prevents T-lymphocytes proliforation / TA-GVHD**

Irradiated Blood Product Indications

- Immunocompromised marrow / organ transplant recipients
- Pts to undergo BMT
- Intrauterine transfusions
- ECMO
- Hodgkins dz
- Congenital Cell mediated immunodeficiencies
- Recipients of directed donations from bilogic relatives
- Others
- FFP, Cryo does not require irradiation

P RBC's and Transfusion Reactions

- Non-hemolytic more common than hemolytic
  - secondary to leukocytes or plasma proteins
- Partially crossmatched is preferred to unmatched
- Only 1 in 2500 have antibodies capable of causing hemolysis
- Mortality varies from 17 - 53% for hemolytic transfusion rxns
- May occur after as little as 10 - 30 cc transfused
- Signs / Symptoms:
  - Chest Pain, Back pain
  - Fever, Chills
  - Dyspnea
  - Hemoglobinuria
  - Hypotension
- Laboratory Analysis:
  - DAT, Haptoglobin, Compatability testing

P RBC's and Transfusion Transmitted Agents

- HIV 1:700,000
- HTLV 1:600,000
- Hep C 1:100,000
- Hep B 1:60,000
- Bacterial Sepsis 1: 10,000

PLATELETS:

WRAMC PARAMETERS

Unconditional → ≤ 15,000
Fever → ≤ 20,000
Bleeding / pnd procedure → ≤ 50,000
Neuro, infant, CT → ≤ 100,000
Pathologist Approval > TWO doses in 24 hours

- Platelet qualitative characteristics more important than quantitative
- One six pack of Platelets should ▯ level by 5 – 10,000/mm^3
- One unit platelets is obtained from one unit whole blood
- If transfusing multiple times, consider single donor platelets, this can result in 6 – fold increased effect of transfusion
- One unit random donor platelets contain ≈ 40cc or 5.5 x 10^{10}/L platelets
- One unit single donor platelets contain ▯ 3 x 10^{11} platelets with a volume as high as 400 cc
- Mointing evidence to suggest transfusion threshold of 5 - 10 x 10^9/L in otherwise stable patient
- Dosing of platelets for DIC or other assoc condition may utilize 20 x 10^9 threshold
  - Dose may be greater than 0.1 - 0.2 units of random donor plt per Kg in this more complex group

CRYOPRECIPITATE

WRAMC PARAMETERS

Bleeding in OR, vWillebrands, Uremia →
Fibrinogen ≤ 100mg/dl

Pathologists Approval → > 20 bags at one time
> 30 bags in 24 hours

- CONTAINS: 100 - 250 mg Fibrinogen
  - 80 - 100 U Factor VIII, VWF,
  - Factor XIII, Fibronectin
- One unit ↑ fibrinogen by approx 50 mg/dL
- One unit is ≈ 10 - 20 cc
- Useful in:
  - consumptive coagulopathies, vWillebrands unresponsive to DDAVP, congenital fibrinogen deficiencies, Massively transfused pts with fibrinogen < 80 – 100 mg / dL, hemophilia A

FFP

WRAMC PARAMETERS

Bleeding / pnd Procedure → PT ≥ 16.5

OR

PTT ≥ 55.0

Pathologist Approval → More than **4 units** at one time

More than **8 units** in 24 hours

- **Contains ~ 1U/ml of factors**
  - **II, V, VII, VIII, XI, X, XI**
  - **Protein C, Protein S, ATIII and various other components**
- **Post transfusion dilution may result in PT /PTT**
  - **However clinical effects do not occur until fluid replacement exceeds one blood volume or PT/PTT > 1.5 – 1.8 times normal**
- **One study sited notes no abnormal bleeding was noted in paracentesis / thoracentesis with PT/PTT up to two time control**
- ***Following have approximately the same amt of coagulation factors as one unit FFP***
  - ***Four to Five Platelet concentrates,***
  - ***One unit single donor platelets***
  - ***One unit whole blood***

Task Force on Blood Component Therapy Recommendations for FFP

- **Urgent reversal of Warfarin therapy**
- **Correction of KNOWN coagulation factor deficiencies**
- **Correction of microvascular bleeding in presence of abnormal PT / PTT ie >1.5 x's normal**
- **Correction of microvascular bleeding in patient transfused > 1 blood volume and when PT / PTT are unavailable**
- **FFP should be given in dose that will achieve a minimum of 30% plasma factor concentration**
  - 10 – 15 cc/Kg
  - 5 – 8 cc/Kg for correction of associated Warfarin anticoagulation
  - Usual starting dose is 2 units

The Future

- Thrombopoietin
- Granulocyte Transfusions
  - Neutropenic patients with fungemia, sepsis
- HBOC: Hgb based Oxygen Carriers
  - Lack antigenicity
  - Shelf life of ≥ 1 year
  - Hb P_{50} :(partial pressure at which hgb is 50% saturated) 12-14mmHg compared to Hgb: 26.5mmHg
  - Associated with HTN
    - May have role in septic shock
  - Several dz specific products in development

References

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